

**BIOLOGY
HIGHER LEVEL
PAPER 2**

Wednesday 11 May 2005 (afternoon)

2 hours 15 minutes

Candidate session number

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INSTRUCTIONS TO CANDIDATES

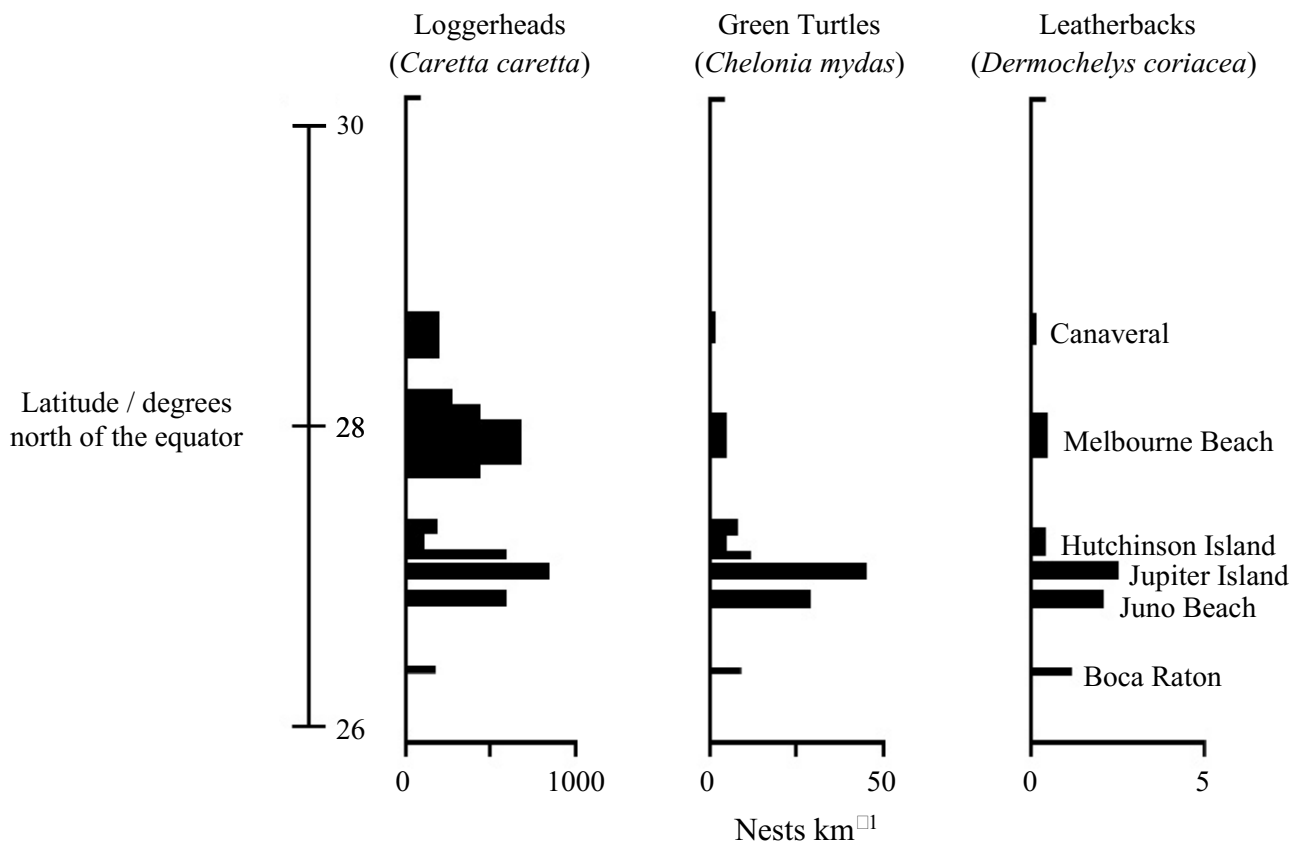
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer two questions from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

SECTION A

Answer **all** the questions in the spaces provided.

- Sea turtles have existed on Earth for millions of years, but are now threatened by human activities, both at sea and on the sandy beaches where they lay their eggs. All species of sea turtle reproduce in a similar way. During the breeding season, when females have mated at sea they emerge from the ocean at night and drag themselves up a beach. They dig a pit into which they lay fertilized eggs. After covering the eggs with sand the females return to the ocean. The warmth of the sun on the sand incubates the eggs allowing the development of young turtles, called hatchlings. These emerge after about 50 days and move down the beach at night to the ocean.

Ecologists have been keeping records of the nesting activity of sea turtles along the eastern coastline of Florida since the 1950s. The bar chart below shows the mean number of nests per kilometre of beach between 1989 and 1998 for the three species of sea turtle that are commonly found.



[Source: M Salmon, *Biologist*, (2003), **50**, pages 163–168]

- State which species of turtle nests in the greatest numbers on Jupiter Island.

[1]

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(Question 1 continued)

- (b) Compare the distribution of nesting in the three species of turtle along the eastern coastline of Florida. [2]

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- (c) The parts of the coastline where there was most nesting were those where there was least human activity and therefore least artificial light. Suggest an experiment that could be done to test whether artificial light discourages nesting. [2]

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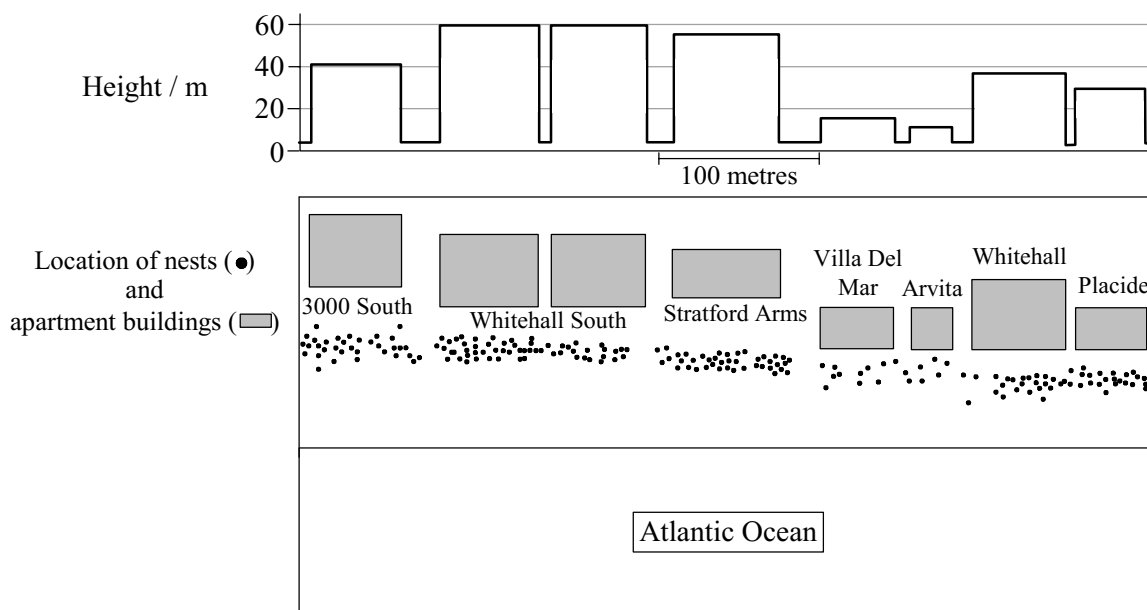
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(Question 1 continued)

A study was undertaken at the southernmost nesting site, at Boca Raton. Here a beach lies adjacent to a series of apartment buildings that are unoccupied during the nesting season. These buildings therefore shade the beach from artificial light further inland. The location of nest sites along the beach has been accurately recorded, in relation to the position of the apartment buildings. The chart below shows the locations of the nests and apartment buildings and the height of the buildings as seen from the beach.



[Source: M Salmon, *Biologist*, (2003), **50**, pages 163–168]

- (d) Explain how the distribution of turtle nests provides evidence for female turtles choosing sites that are dark at night.

[4]

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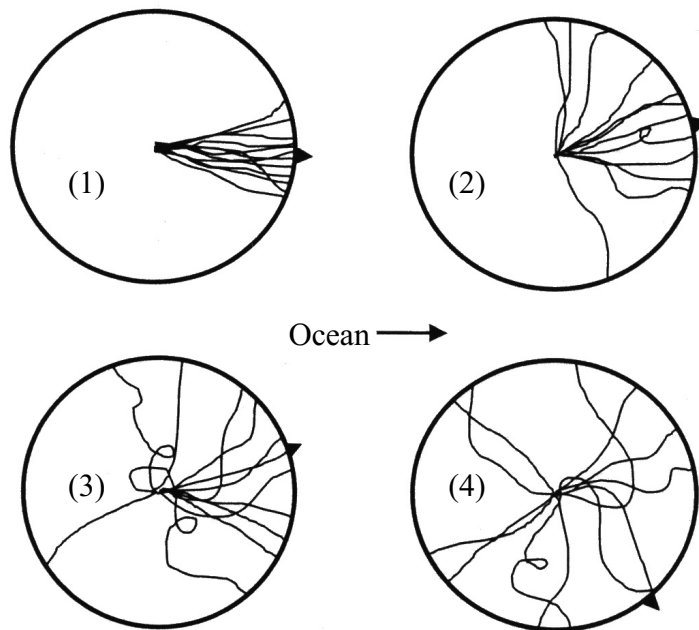
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(Question 1 continued)

On beaches where there is no human activity, hatchlings move directly towards the ocean after emergence at night. The hatchlings can orientate themselves using one or more external stimuli. An experiment was done at Boca Raton to test the ability of hatchlings to locate the ocean at different levels of artificial light. Four sites were chosen and numbered 1-4, ranging from the darkest site (1), to the site most exposed to artificial lighting (4). At each site a four-metre diameter circle was marked. Hatchlings were released at the centre of each circle and the trails made in the sand by their movements were recorded. The diagrams below show these trails. The arrow head on the outside of the circle shows the mean direction of the tracks.



- (e) Compare the movement of the hatchlings at the different intensities of artificial light. [2]

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- (f) Deduce **one** external stimulus, and the source of this stimulus, that allows hatchlings to orientate themselves at sites unaffected by human activity. [1]

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(Question 1 continued)

(g) Using the data in this question,

- (i) explain **two** reasons for artificial light reducing the chances of survival of sea turtles. [2]

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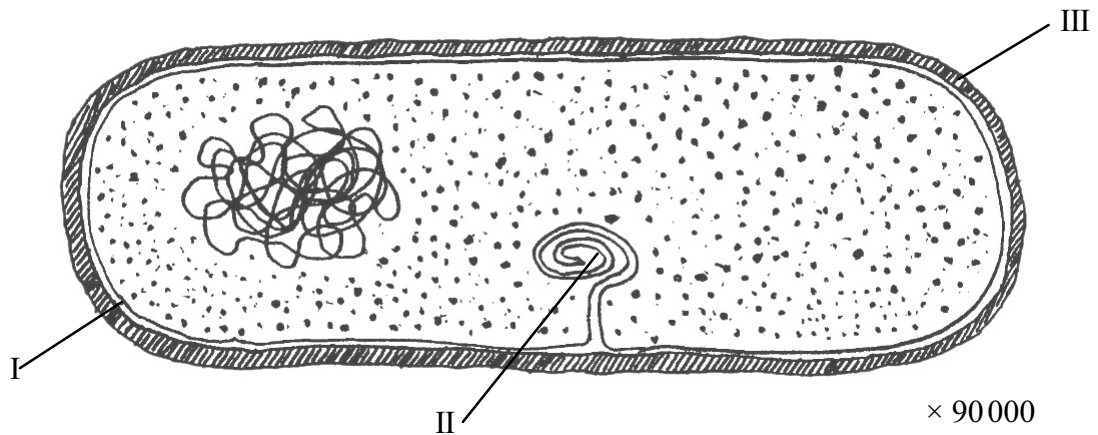
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- (ii) suggest **one** conservation measure, aimed at increasing the chances of survival of sea turtles. [1]

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2. The diagram below shows the structure of a cell.



- (a) State the names of I and II. [2]

I:

II:

- (b) Calculate the actual length of the cell, showing your working. [2]

Answer:

- (c) State the function of the structure labelled III. [1]

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- (d) Deduce which type of cell is shown in the diagram, giving reasons for your answer. [2]

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3. Enzymes are used by living organisms to catalyse reactions. Some of these reactions occur in the cytoplasm of cells. Other reactions take place outside cells, for example the digestion of foods in the human gut.

- (a) State the name used by biochemists for the chains and cycles of reactions that occur **inside cells**. [1]

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- (b) Enzymes of digestion in humans are secreted by glands. They have a pH optimum which allows them to work efficiently in the part of the gut into which they are secreted.

- (i) In the table below, identify the missing enzyme, the two glands, and the pH optimum. [4]

Name of enzyme	Gland secreting the enzyme	Substrate	Products	pH optimum
amylase		starch	maltose	
		triglycerides	fatty acids and glycerol	7

- (ii) Outline the effect of pH values above and below the optimum on enzyme structure. [2]

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- (c) Enzymes that work inside cells are sometimes affected by non-competitive inhibitors. Explain how a non-competitive inhibitor affects the activity of an enzyme. [3]

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SECTION B

Answer **two** questions. Up to two additional marks are available for the construction of your answers. Write your answers on the answer sheets provided. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.

4. (a) The process of translation involves the use of transfer RNA (tRNA) and amino acids. Outline the structure of tRNA. [5]
- (b) Draw the basic structure of an amino acid, and label the groups that are used in peptide bond formation. [4]
- (c) Explain the process of translation. [9]
5. (a) Plants are classified together in a kingdom. Other organisms are classified in other kingdoms. Outline the value of classifying organisms. [4]
- (b) Draw a labelled diagram to show the external parts of a **named** dicotyledonous plant. [5]
- (c) Explain how roots absorb water and then transport it to the xylem, noting any special adaptations that help these processes to occur. [9]
6. (a) Define the terms *gene* and *allele* and explain how they differ. [4]
- (b) Outline **one** example of inheritance involving multiple alleles. [5]
- (c) Using an example you have studied, explain a cross between two linked genes, including the way in which recombinants are produced. [9]
7. (a) Blood vessels carry blood to and from the kidney. Draw a labelled diagram to show the internal structure of the kidney, including the vessels that are connected to it. [5]
- (b) Compare the composition of blood arriving at the kidney with the composition of blood carried away from it. [4]
- (c) Explain the relationship between the structure and functions of arteries, capillaries and veins. [9]
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